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April 11, 2000

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445-12th Street S.W.
Washington, D.C. 20554

Re: Ex Parte Filing
WT Docket No. 99-168

Dear Ms. Salas:

On April 11, 2000, a meeting was held with Stan Wiggins, Marty Liebman, and Chris Monteith of the Wireless Telecommunications Bureau ("WTB"), Julius Knapp, Ira Keltz, and Tom Derenge of the Office of Engineering and Technology ("OTE"), Jeff Musser of Adaptive Broadband Corporation ("Adaptive"), Peter Hadinger of TRW, and Joan Griffin of Kelley Drye & Warren (representing Adaptive) to discuss whether any equipment has been deployed that complies with the out of band emission ("OOBE") limits requested by Adaptive and TRW in the above-referenced proceeding. Both Adaptive and TRW have asked that the Commission adopt in-band OOBE limits of $76 + 10 \log (P)$ for base station equipment and $65 + 10 \log (P)$ for subscriber equipment.

At the meeting, the Commission staff indicated concern about the disparity between what the TDD equipment makers were presenting and what potential 3rd generation PCS suppliers have targeted in the ITU specification. The loose ITU specification apparently reflects the greater difficulty in filtering wideband signals such as WCDMA and there was concern about overly constraining 3G development through too stringent emissions limits.

Adaptive's handout (Attachments 1 and 2) demonstrated that the OOBE requirements in this case were no tighter than those required of U-NII operations at 5GHz. TRW presented its analysis (Attachment 3) showing the feasibility of implementing tight rolloff

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Secretary
Federal Communications Commission
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Page Two

waveforms using digital filtering techniques on its TDD waveform, which is based on a wideband CDMA modulation. TRW noted that existing GPS/Glonass protection requirements at L-band for handheld CDMA mobile satellite equipment were more than 20dB more stringent in a comparable fractional bandwidth rolloff and demonstrate that output amplifiers can readily meet the required linearity.

Finally, it was noted by the companies that 3G waveforms identified thus far would most likely compete for the same paired 10 MHz allocations that wideband TDD also targets. In this case, the TDD operations need protection from emissions in the paired 5MHz bands - less likely to support WCDMA. As the emission requirements for the 5MHz pairs will naturally be more stringent than the 10MHz pairs, a symmetric mask would be sufficient to protect both TDD and WCDMA operation in the 10MHz pairs. If the Commission elected to allow more relaxed masks for the 10MHz pairs, the market would chose the appropriate technology for those bands without the FCC showing technical favoritism to either 3G or TDD.

Two copies of this filing are enclosed as required by Section 1.1206 of the Commission's Rules. Please contact the undersigned if you have any questions regarding this filing.

Sincerely,

A handwritten signature in black ink, appearing to read "Joan M. Griffin". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Joan M. Griffin

Enclosures

cc: Stan Wiggins
Marty Liebman
Chris Monteith
Julius Knapp
Ira Keltz
Tom Derenge

1. SUMMARY.

This document outlines the radio system architecture and specification for Adaptive Broadband's AB-ACCESS 5GHz U-NII product (Unlicensed National Information Infrastructure).

The AB-ACCESS Radio complies with the requirements of FCC part 15 sub-part E rules (class A and B) detailed within U-NII docket FCC 98-121. These are summarised in section 2. It is also a design aim that the radio will meet UL and CE approvals.

2. FCC Part 15 Requirements.

2.1 Overview.

The FCC have recently assigned 300MHz of spectrum between 5GHz and 6GHz to facilitate Unlicensed National Information Infrastructure (U-NII) carriers to provide wireless broadband data services. The specifications amend the FCC part 15 rules for radio devices as detailed in ET Docket 96-102, revised June 24 1998 (FCC 98-121). The following 3 bands, each of 100MHz, have been assigned :-

LOWER	5.15GHz to 5.25GHz	Note - Indoor use only with integral antenna
MIDDLE	5.25GHz to 5.35GHz	
UPPER	5.725GHz to 5.825GHz	

2.2 Power Limits.

LOWER	lesser of 50mW or 4dBm + 10logB
MIDDLE	lesser of 250mW or 11dBm + 10logB
UPPER	lesser of 1W or 17dBm + 10logB

B is defined as the 26dB bandwidth and is the width of the signal between one frequency below and one frequency above the carrier frequency that are 26dB down relative to the maximum level of the modulated carrier. The maximum allowable 26dB bandwidth is 20MHz.

In any 1MHz bandwidth the peak power spectral density must not exceed 4, 11 and 17dBm in the LOWER, MIDDLE and UPPER bands respectively. The peak modulation excursion to peak transmit power shall not exceed 13dB in any 1MHz bandwidth, this requirement is applicable to multi-carrier systems.

2.3 Antenna Considerations.

With MIDDLE and UPPER bands, if transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. The LOWER band is limited to 6dBi antenna gain and the antenna must be integral to the radio electronics.

Fixed point-to-point devices operating in the UPPER band may employ transmitting antennas with up to 23dBi gain without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed point-to-point devices employing antenna gain greater than 23dBi then both the peak transmit power and peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 23dBi. Note, fixed point-to-point operations exclude the use of point-to-multipoint systems, omni-directional applications and multiple collocated transmitters transmitting the same information.

2.4 Unwanted Emission Limits.

For transmitters operating in either LOWER or MIDDLE bands, all emissions outside of the operating band shall not exceed -27dBm measured in a 1MHz resolution bandwidth.

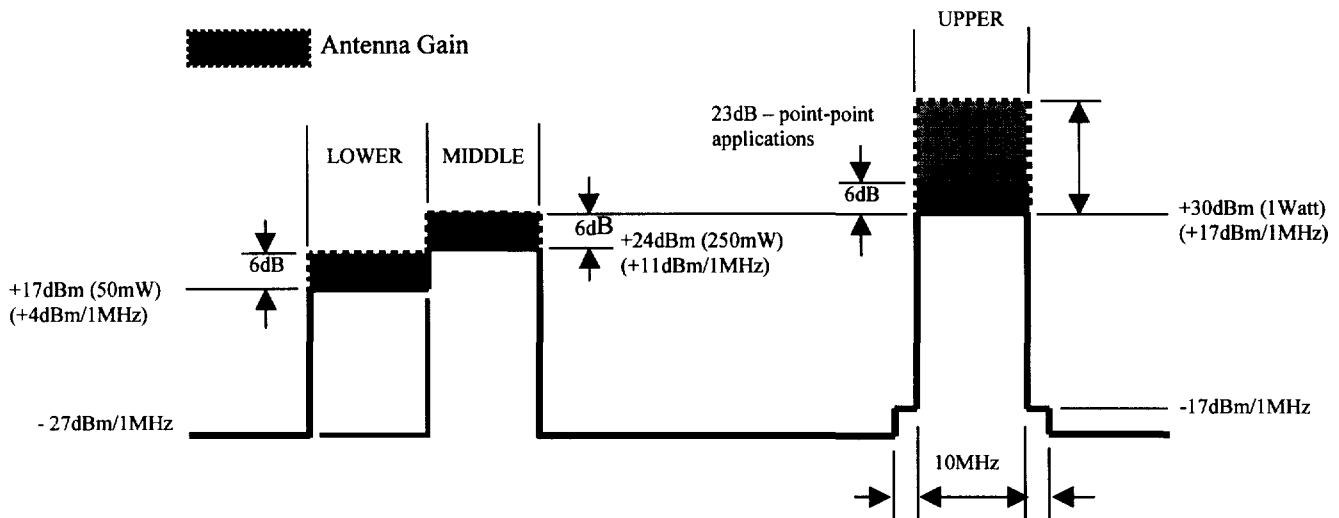
For transmitters operating in the UPPER band, all emissions from the band edge to 10MHz above and below the band edge shall not exceed an EIRP of -17dBm/1MHz. For frequencies 10MHz greater above or below the UPPER band, emissions shall not exceed -27dBm/1MHz.

Sections 15.205 and 15.209 of the FCC Part 15 rules also apply. Devices that use an AC power line must further comply with 15.207.

2.5 Spectrum Etiquette.

Devices shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

2.6 Transmit Output Power and Emission Limit Summary.



OBE requirement is -27 dBm/1MHZ

6.25 kHz = 38 dBHz = -22 dB/Mhz

-27dBm/1MHz = -57 dBW/1MHz = -117dBw/Hz = -79 dBW/6.25kHz (-117 + 38 = -79)

= 79 + 10log(P)

In other words, the U-NII band OBE requirements require that Adaptive Broadband equipment meet OBE requirements of the order that we are requesting be applied at 700 MHz. And we have been certified by the FCC as meeting the Part 15 requirements.



Grant_Form-SU.htm

(click to view)



FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554



GRANT OF EQUIPMENT AUTHORIZATION
Certification

Adaptive Broadband Limited
First Floor, Block C1
The Westbrook Centre, Milton Road
Cambridge, England CB4 1YQ

Date of Grant: 08/27/1999

Application Dated: 04/23/1999

Attention: Peter Simpson

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER OJBAB-ACCESS-SU01

Name of Grantee Adaptive Broadband Limited

Equipment Class: Part 15 Low Power
Communication Device
Transmitter

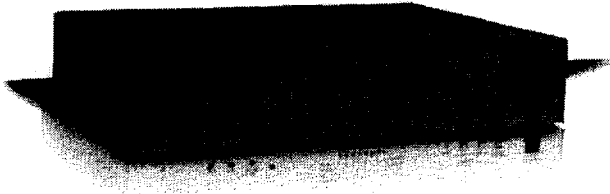
Notes: UNII System

<u>Grant Notes</u>	<u>FCC Rule Parts</u>	<u>Frequency Range (MHZ)</u>	<u>Output Watts</u>	<u>Frequency Tolerance</u>	<u>Emission Designator</u>
	15E	5270 - 5330	0.0063		
	15E	5745 - 5805	0.02		

Mail To:

Peter Simpson, Mr
ADAPTIVE BROADBAND LIMITED
FIRST FLOOR, BLOCK C1 THE WESTBROOK CENTRE, MILTON ROAD
CAMBRIDGE, CB4 1YQ
ENGLAND

EA93980



LYNX™ DS-3 (45 Mbps) Capacity

License-Free Digital Microwave Radio

The new LYNX.sc6 DS-3 is the first medium-capacity member of Western Multiplex license-free digital microwave radio family. LYNX.sc6 DS-3, with over 45 Mbps capacity, transports 672 full duplex channels of 64kbps voice and data traffic. The LYNX.sc6 DS-3 operates under Part 15.401 of the FCC rules (U-NII) and IC RSS-210 (LE-LAN); these rules allow license-free deployment in the USA and Canada.

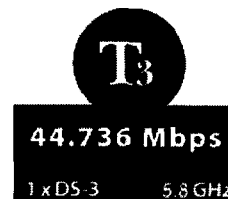
Applications

The LYNX DS-3 digital microwave radio is easily connected to voice, data or video sources. Outstanding system provides wireless point-to-point link distances greater than 15 miles, line-of-sight (under current US and Canada EIRP restrictions). Hub and repeater configurations are also easily implemented.

Typical applications include cellular/PCS BTS to PSTN interconnect, rural telephone, remote data connection, in addition to quick turn up and establishment of DS-3 transport for temporary/emergency situations as well as permanent revenue-generating installations. Furthermore, this product makes it easy to scale up the capacity of radios in existing multi-T1 paths operating in the 5.725-5.850 GHz ISM band.

Features

- No operating license required (in many countries)
- DS-3 (45 Mbps) Interface
- Frequency Range
 - Single Channel: 5,725-5,825 MHz
 - Dual Channel: 5,250-5,350 MHz and 5,725-5,825 MHz
- Compliant with FCC Part 15.401 (U-NII) and IC RSS-210 (LE-LAN) rules
- Wayside T1
- Point-to-point communications from less than 1 mile to more than 15 miles
- Wide DC Power Input ± 20 to ± 63 V
- Wide operational temperature
- Built-in loopback, far-end monitoring and orderwire
- 2 Year Warranty



Intertek Testing Services

1365 Adams Court, Menlo Park, CA 94025

Western Multiplex, U-NII Radio
FCC ID: HZB-US8-45

Date of Test: December, 1999

4.4 Out of Band Conducted Emissions, FCC Rule 15.407(b)

Requirement

For transmitters operating in the 5.725-5.825 GHz band, all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz. For frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

Test Procedure

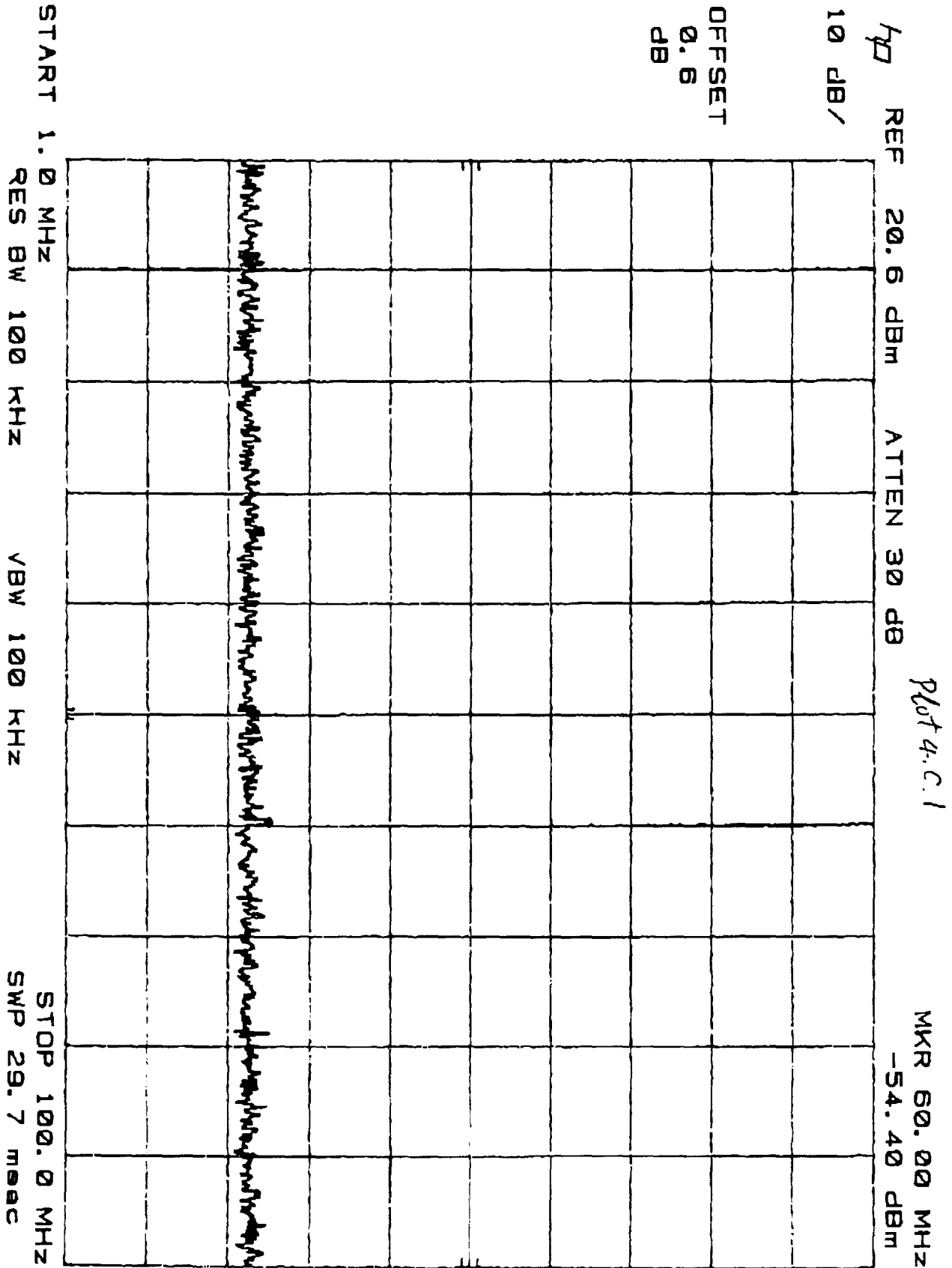
The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

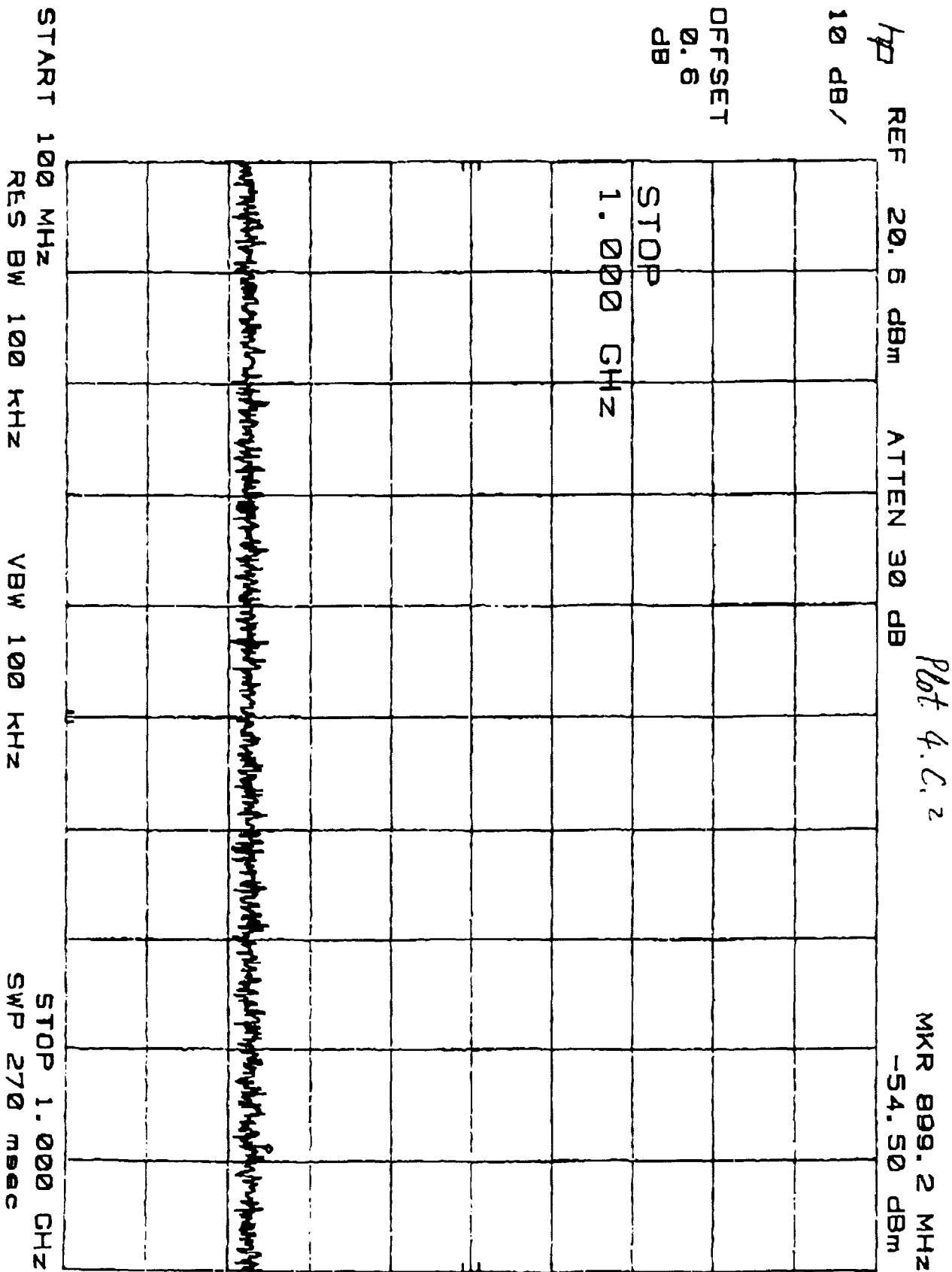
Test Result

Refer to the following plots for out of band conducted emissions data:

Plot 4.c.1 - 4.c.10: 5750.9 GHz band, Low Channel Emissions

Plot 4.d.1 - 4.d.9: 5798.9 GHz band, High Channel Emissions





04/08/00 THU 17:07 FAX 408 542 5300

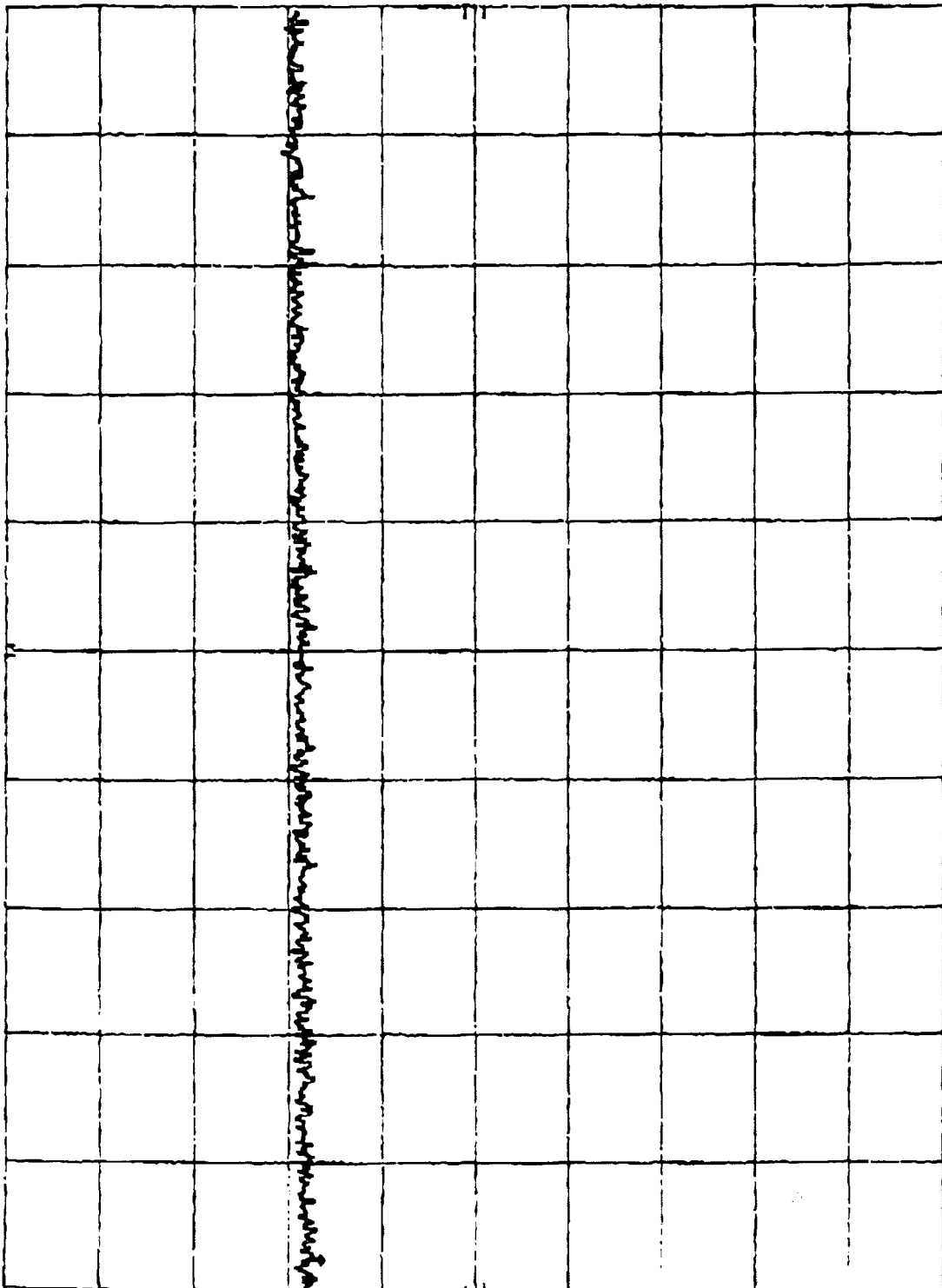
GLENAYRE WESTERN MIX

Plot 4.C, 3

MKR 2.461 GHz
-45.90 dBm

hp REF 20.6 dBm ATTEN 30 dB
10 dB/

OFFSET
0.6
dB



START 1.00 GHz STOP 2.50 GHz
RES BW 1 MHz VBW 1 MHz SWP 37.5 msec

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P.06/23
COMMUNICATIONS MANAGEMENT UNIT

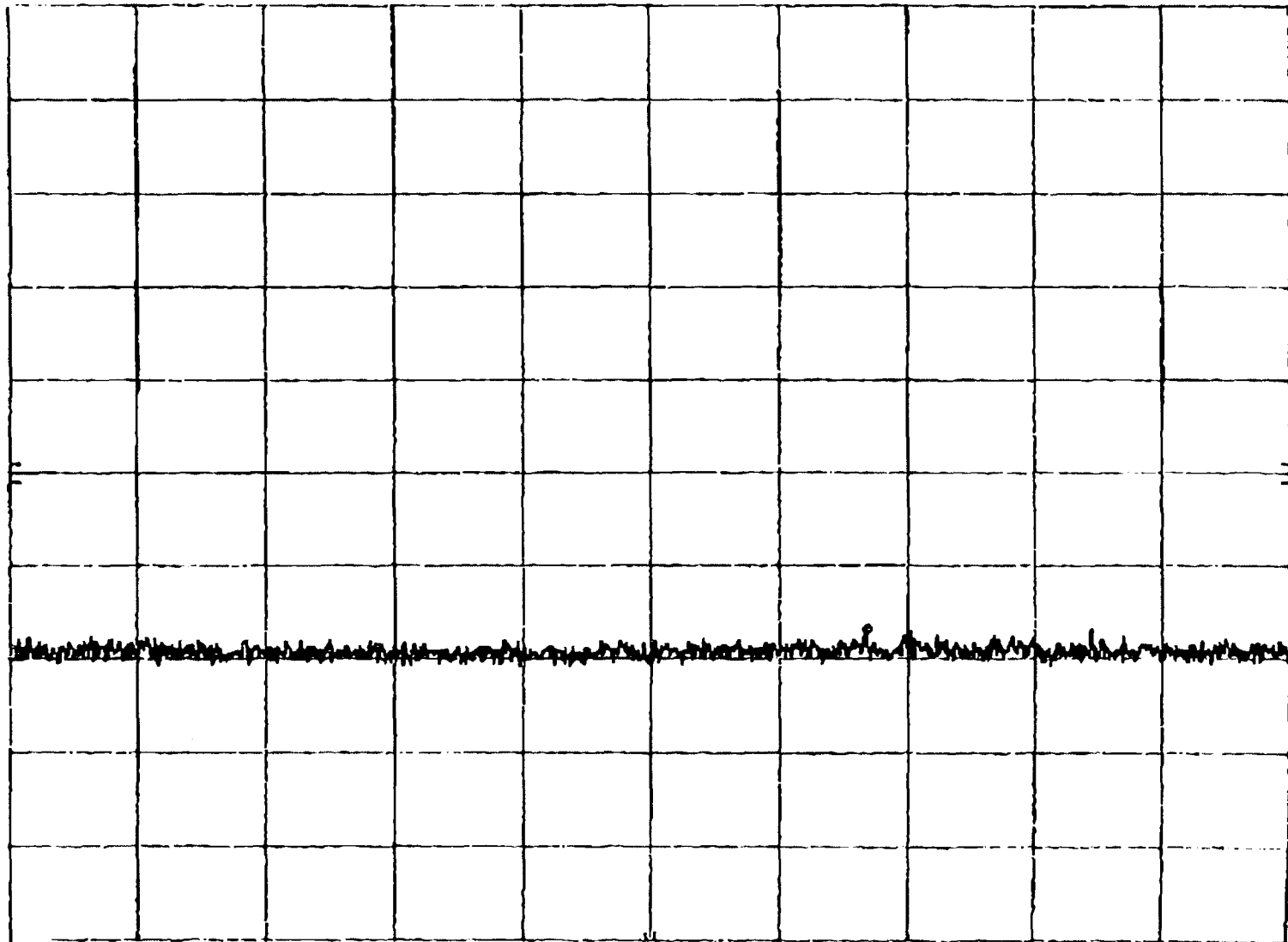
Plot 4.C.4

MKR 4.638 GHz
-46.20 dBm

hp REF 20.8 dBm ATTEN 30 dB

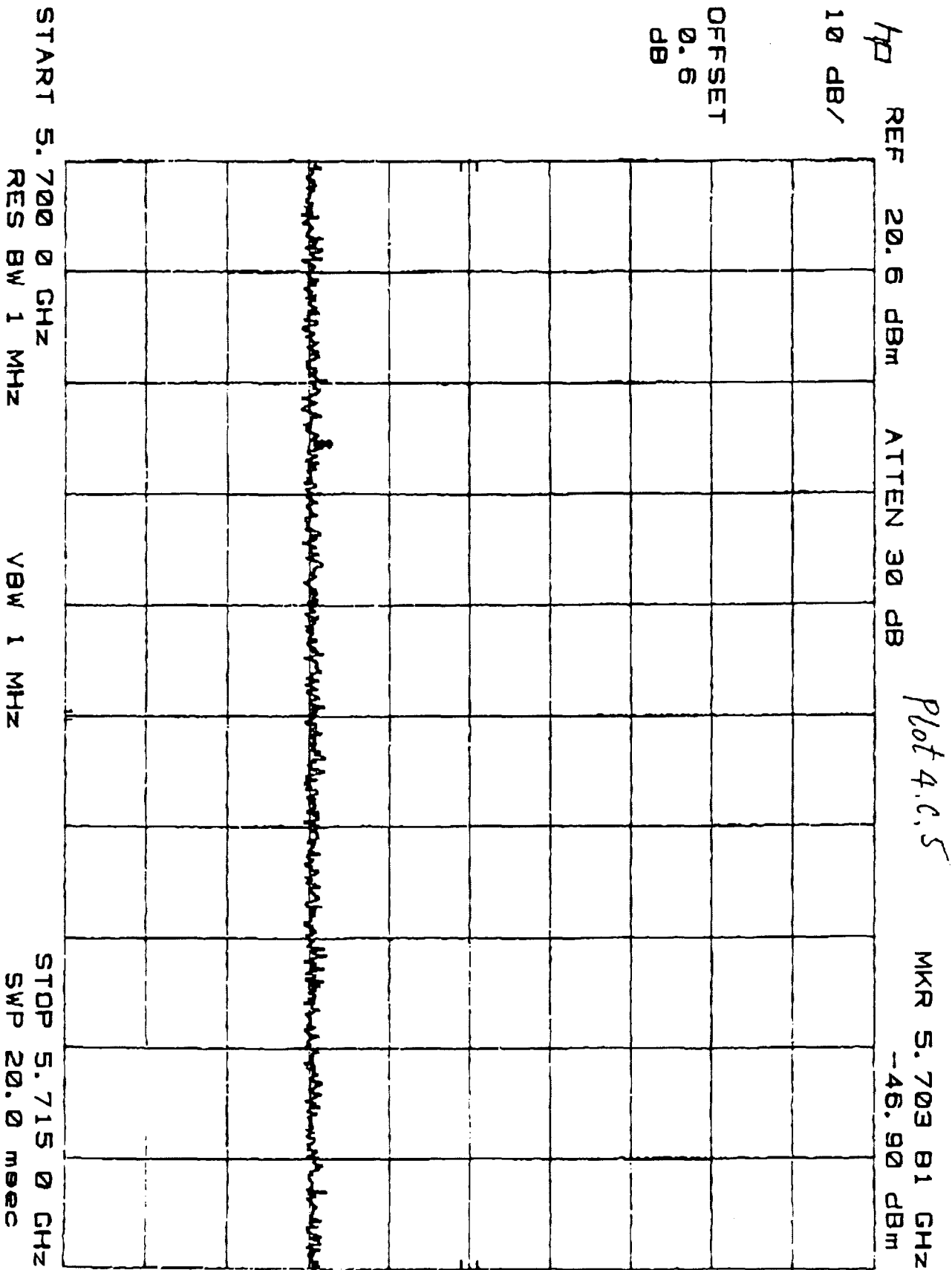
10 dB/

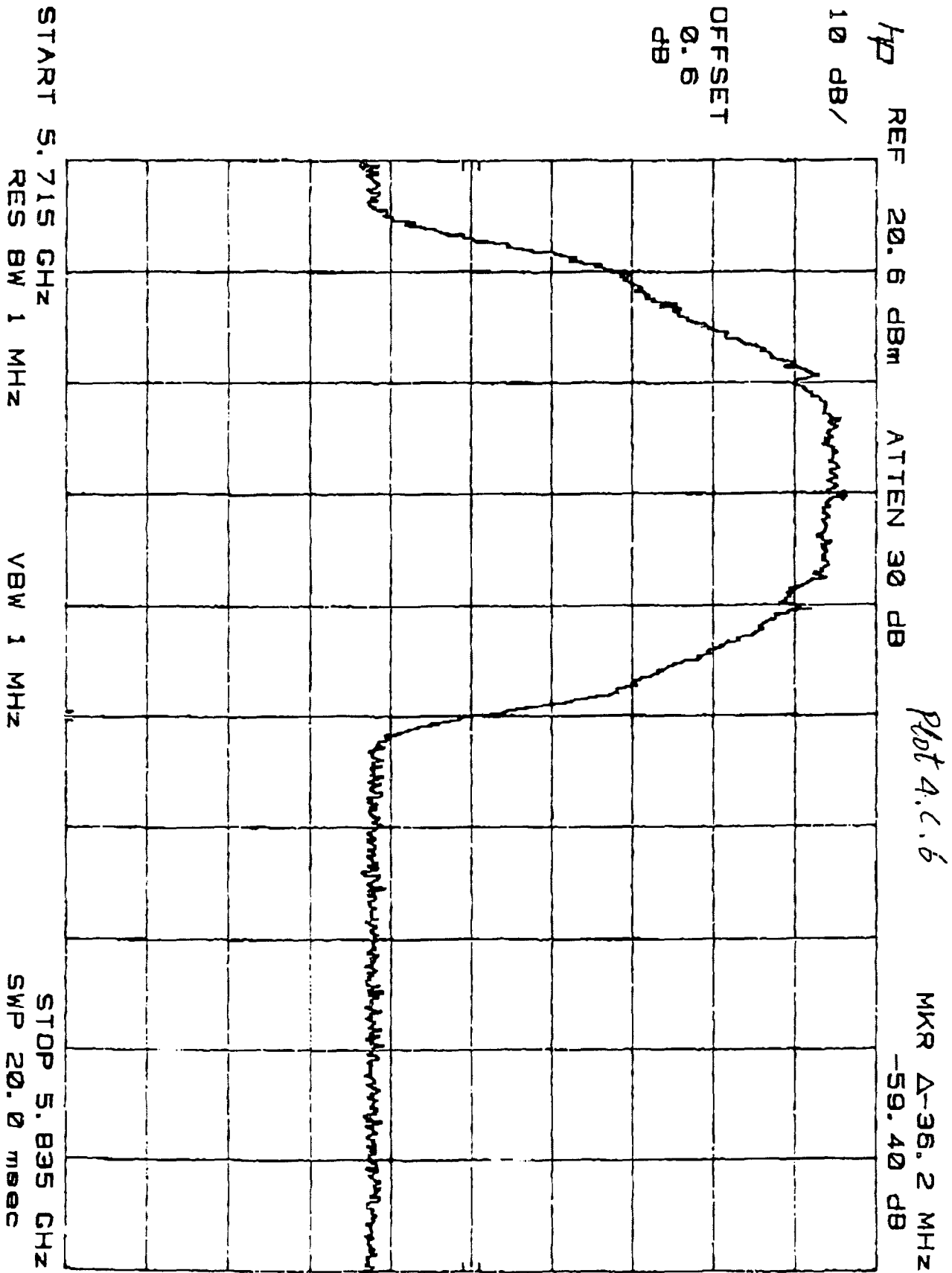
OFFSET
0.6
dB

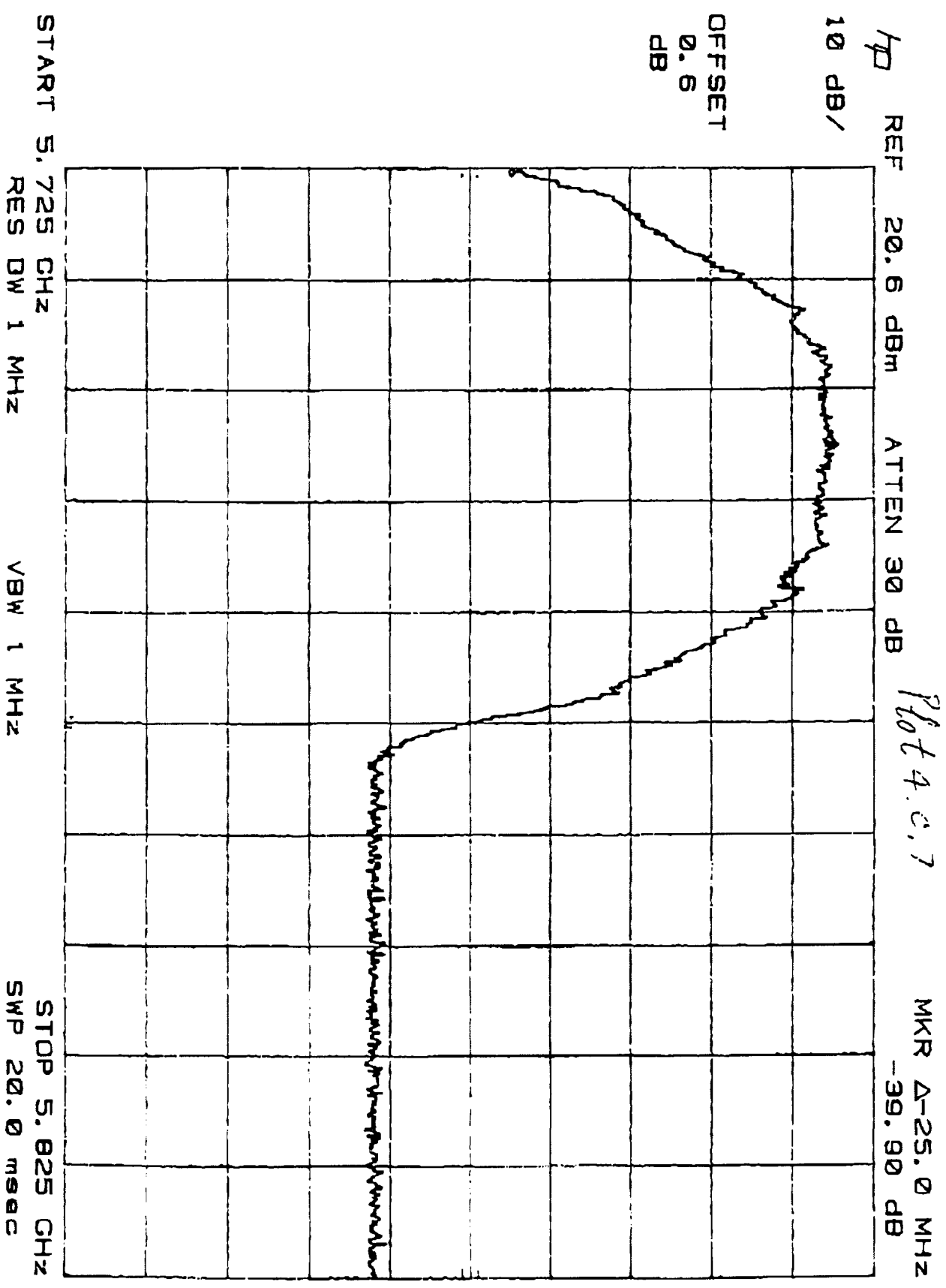


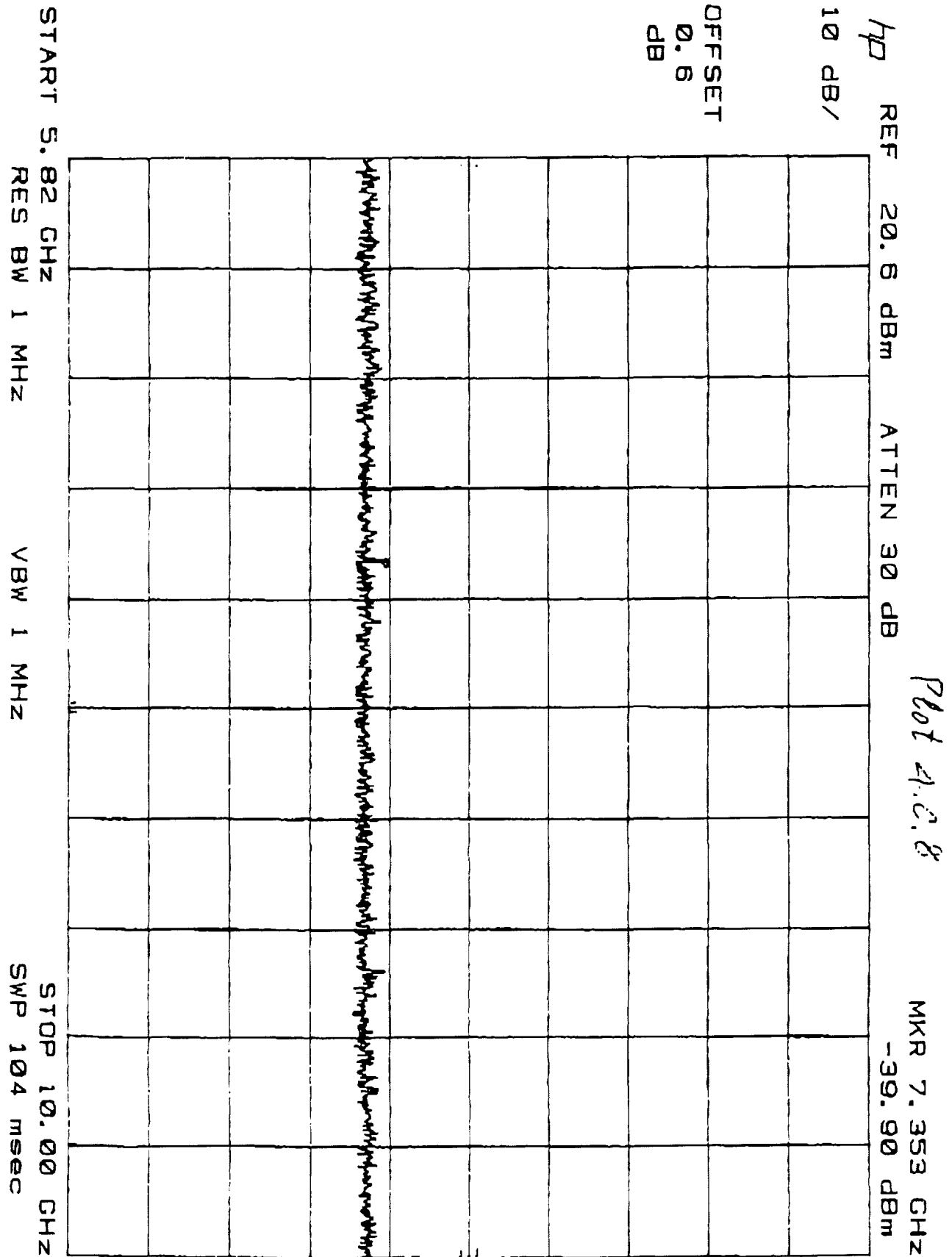
START 2.50 GHz STOP 5.70 GHz
RES BW 1 MHz VBW 1 MHz SWP 80.0 msec

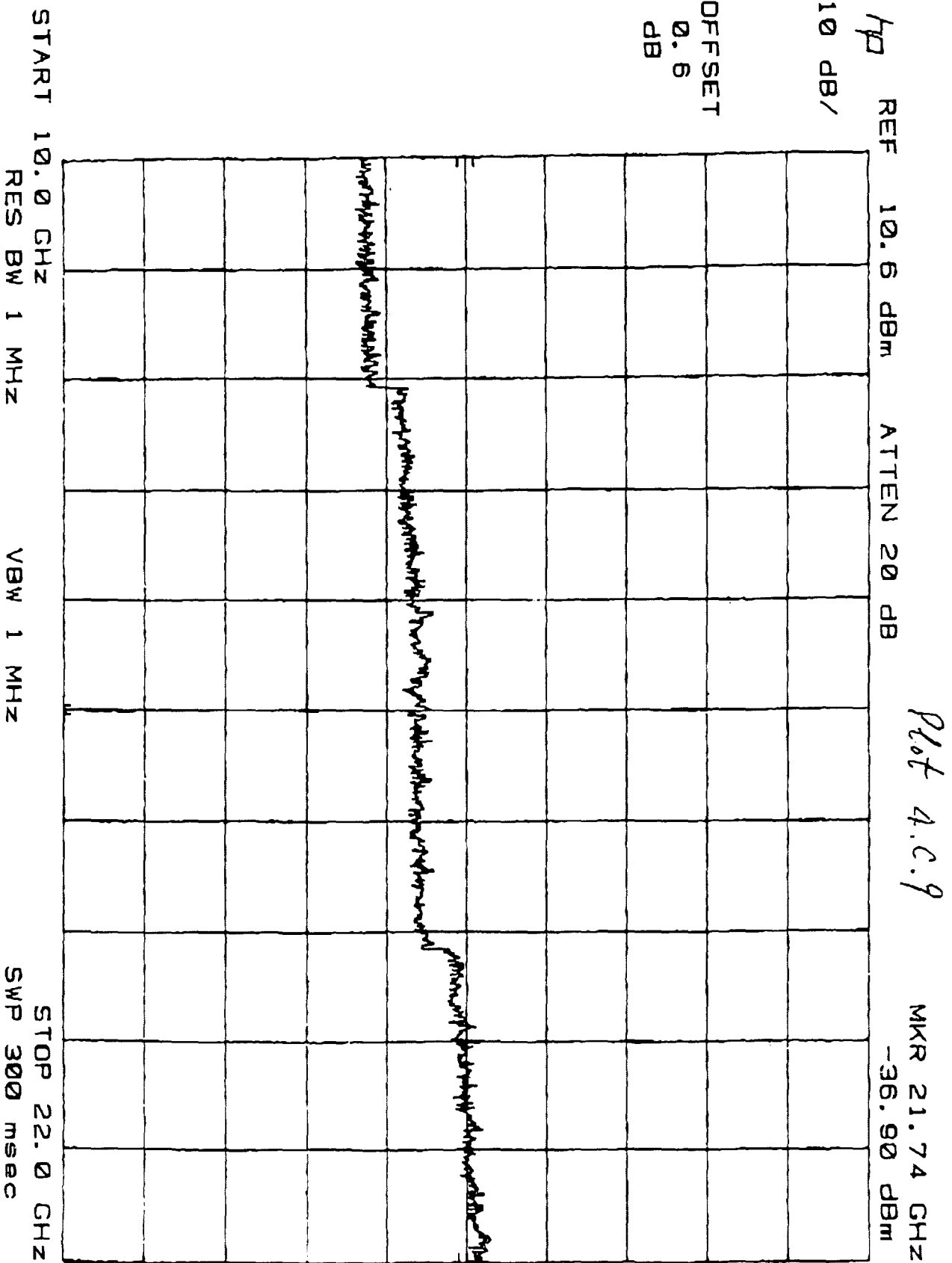
04/08/00 THU 17:08 FAX 408 502 3300



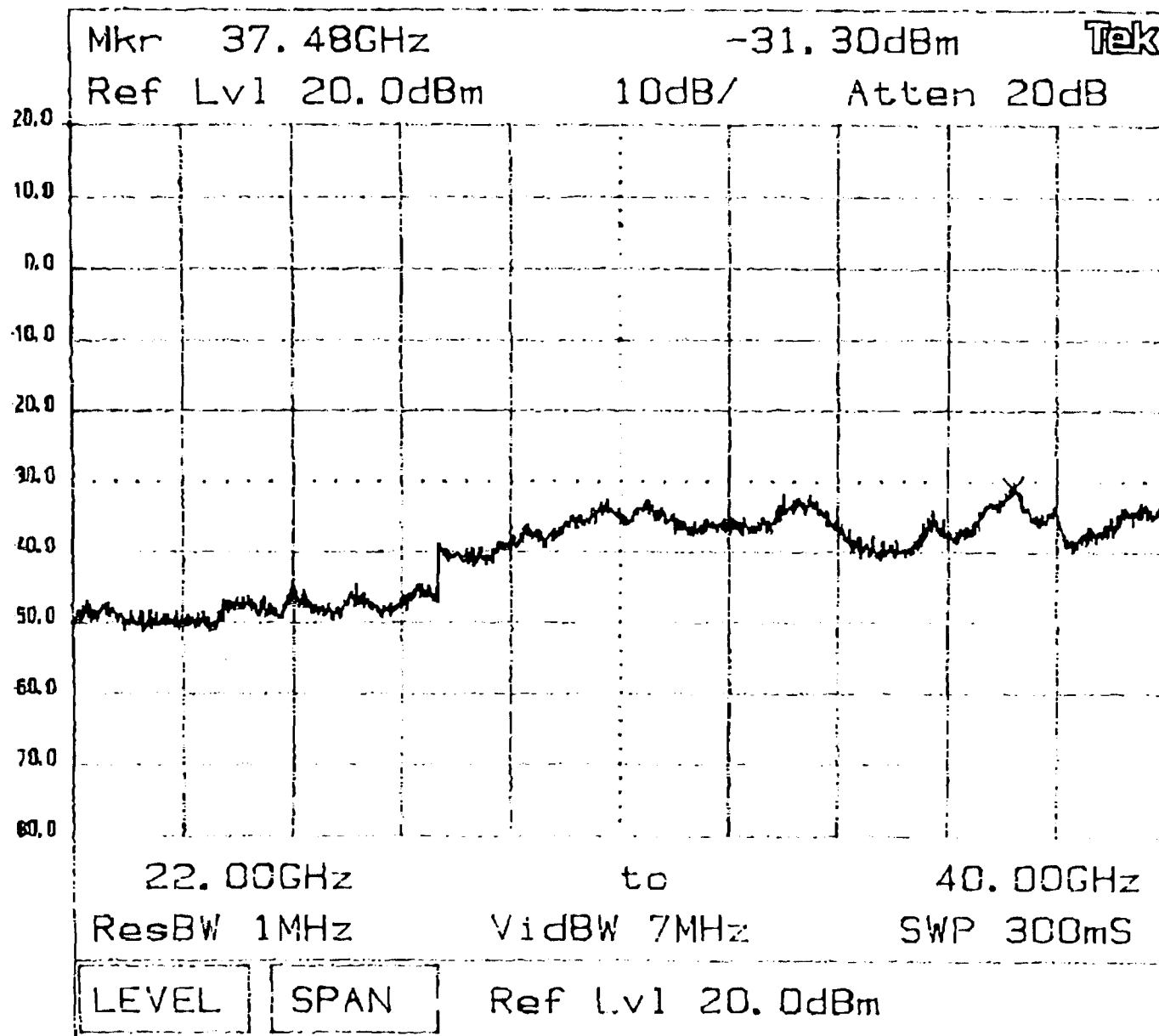








RF 40.00



KNOB 2

KNOB 1

KEYPAD

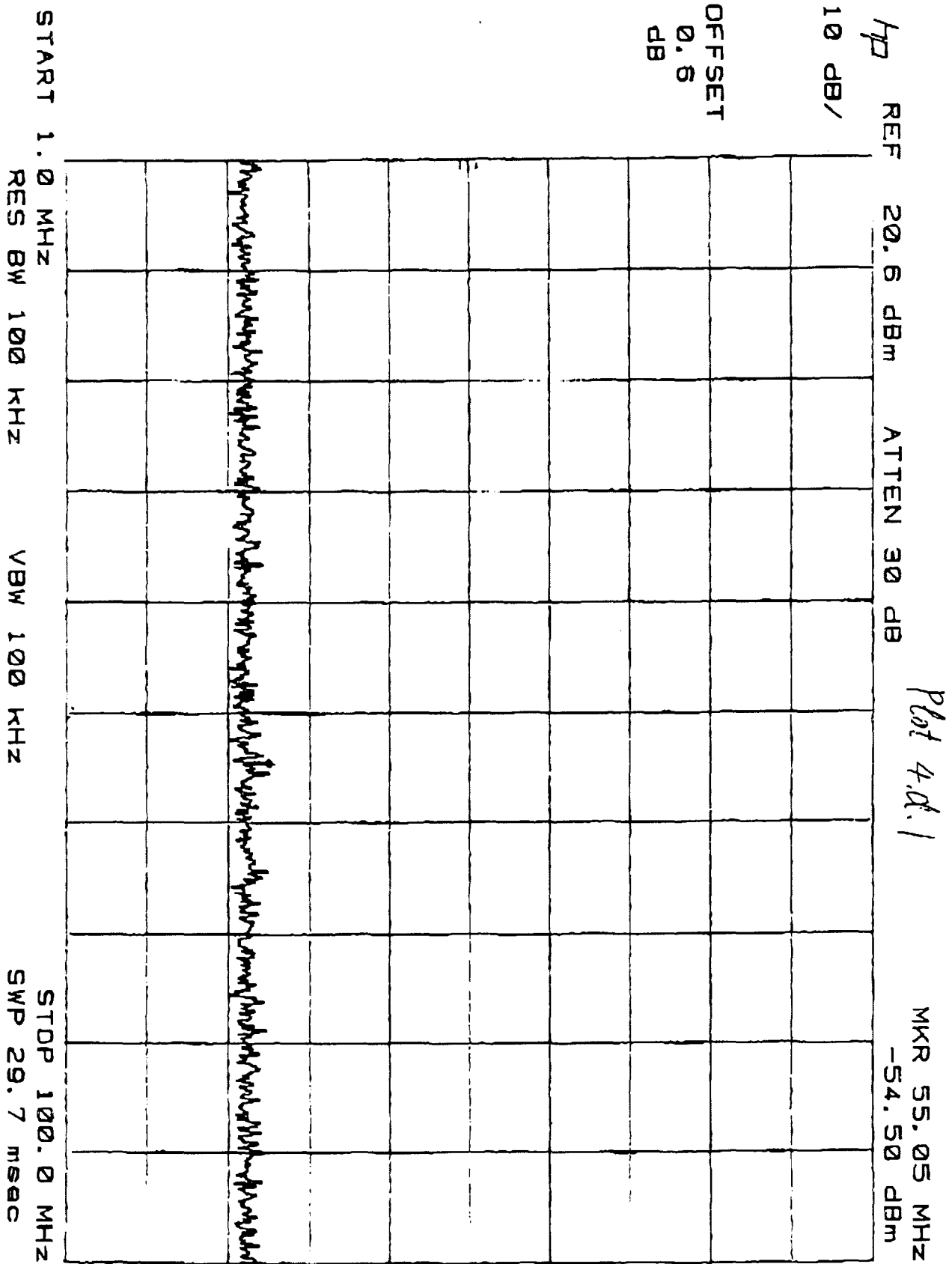
Tektronix

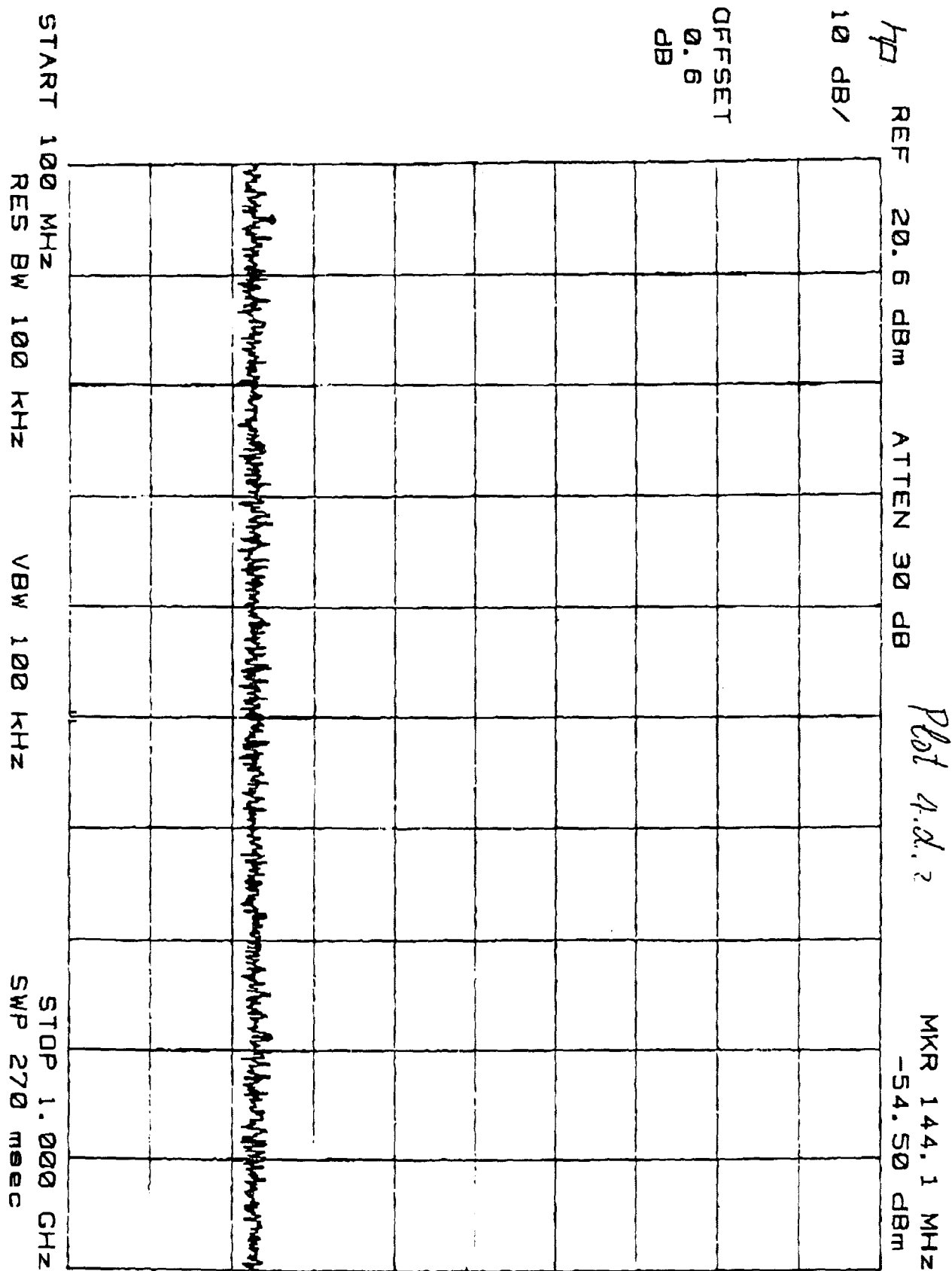
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04/08/00 THU 17:11 FAX 408 542 5300

GLENAYRE WESTERN MIX

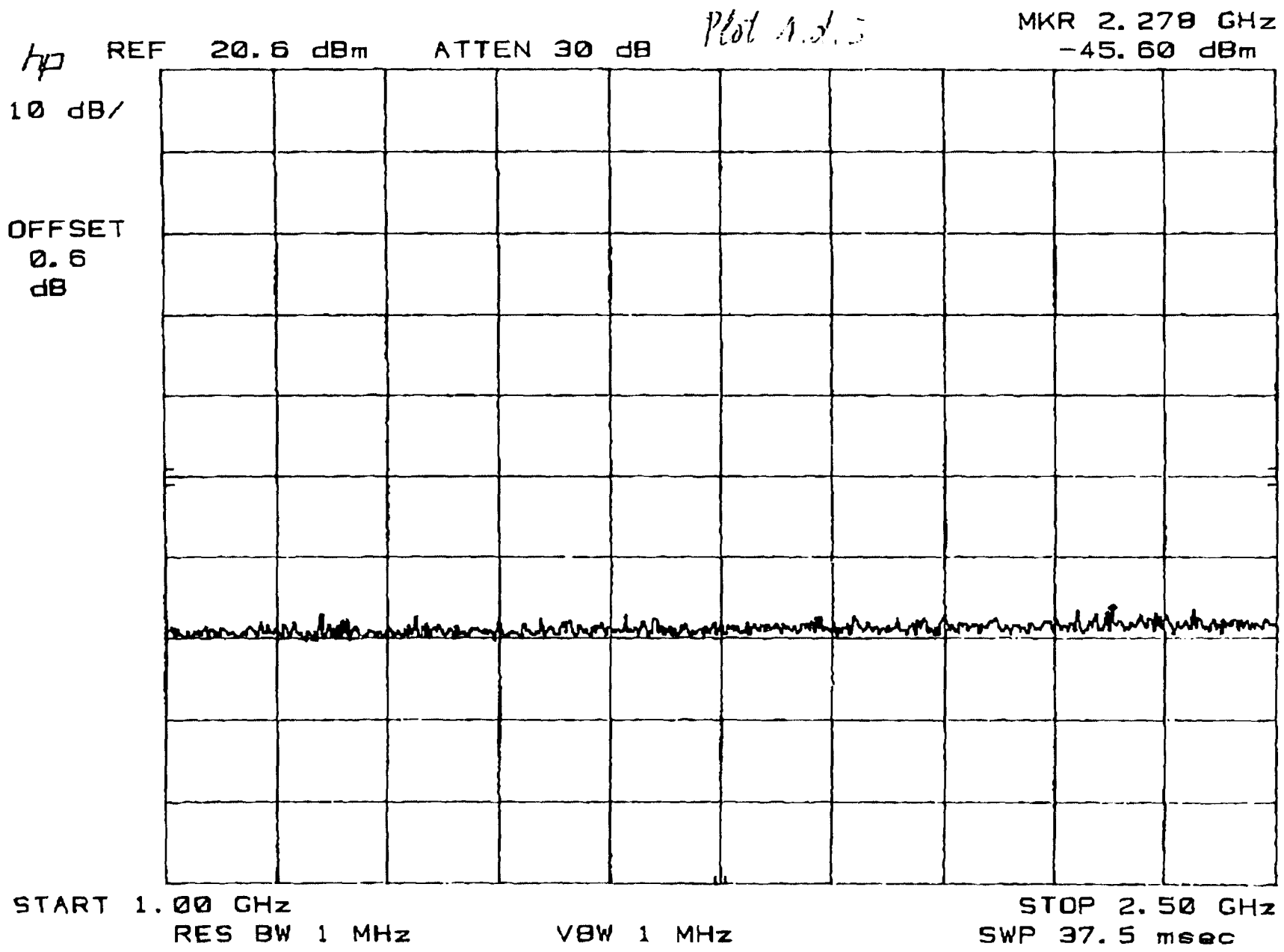
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GLENVIEW WISCONSIN MIL

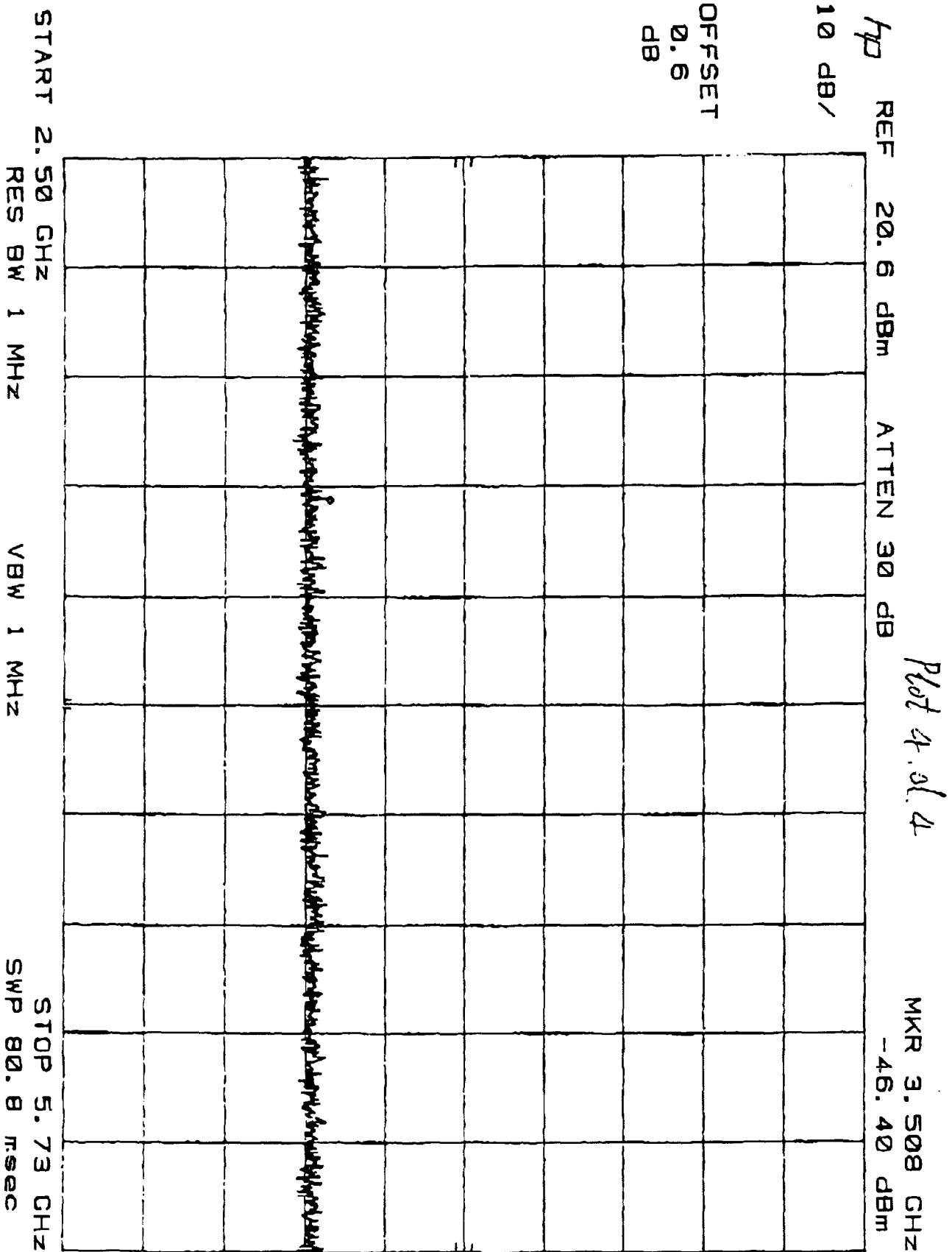
P.16/23
0000

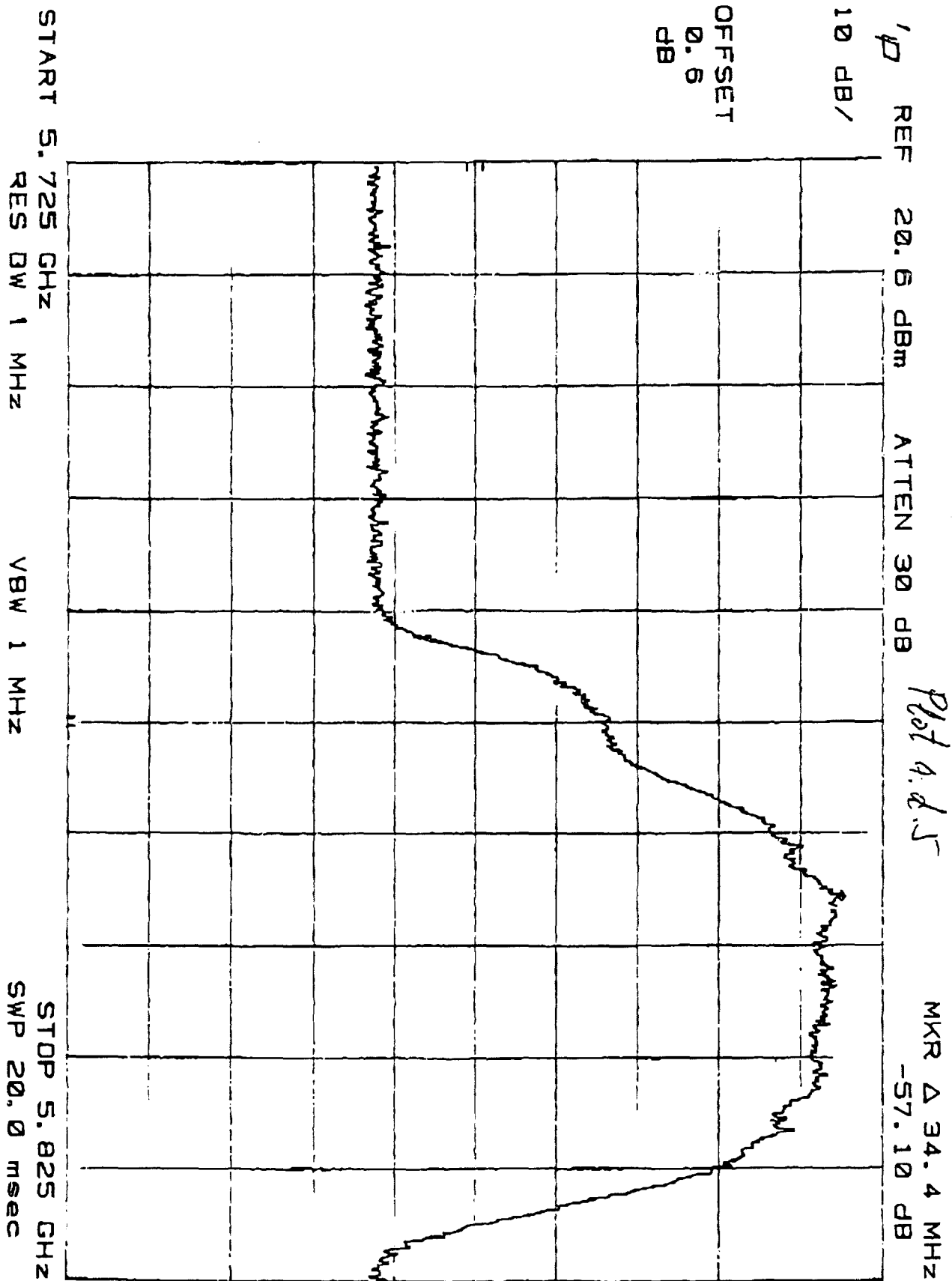


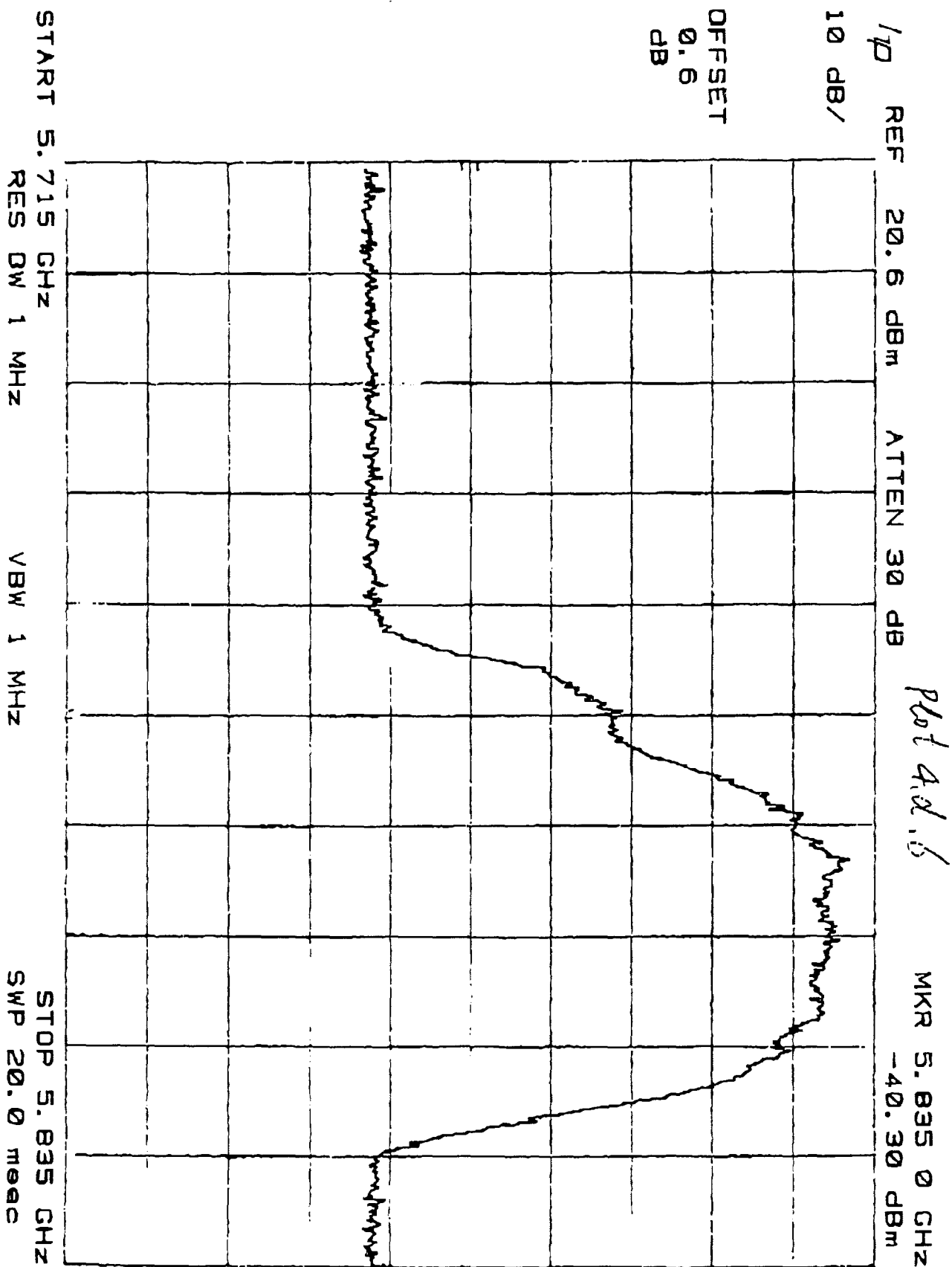
04/08/00 THU 17:11 FAX 408 342 5300

GLENAYRE WESTERN MUX

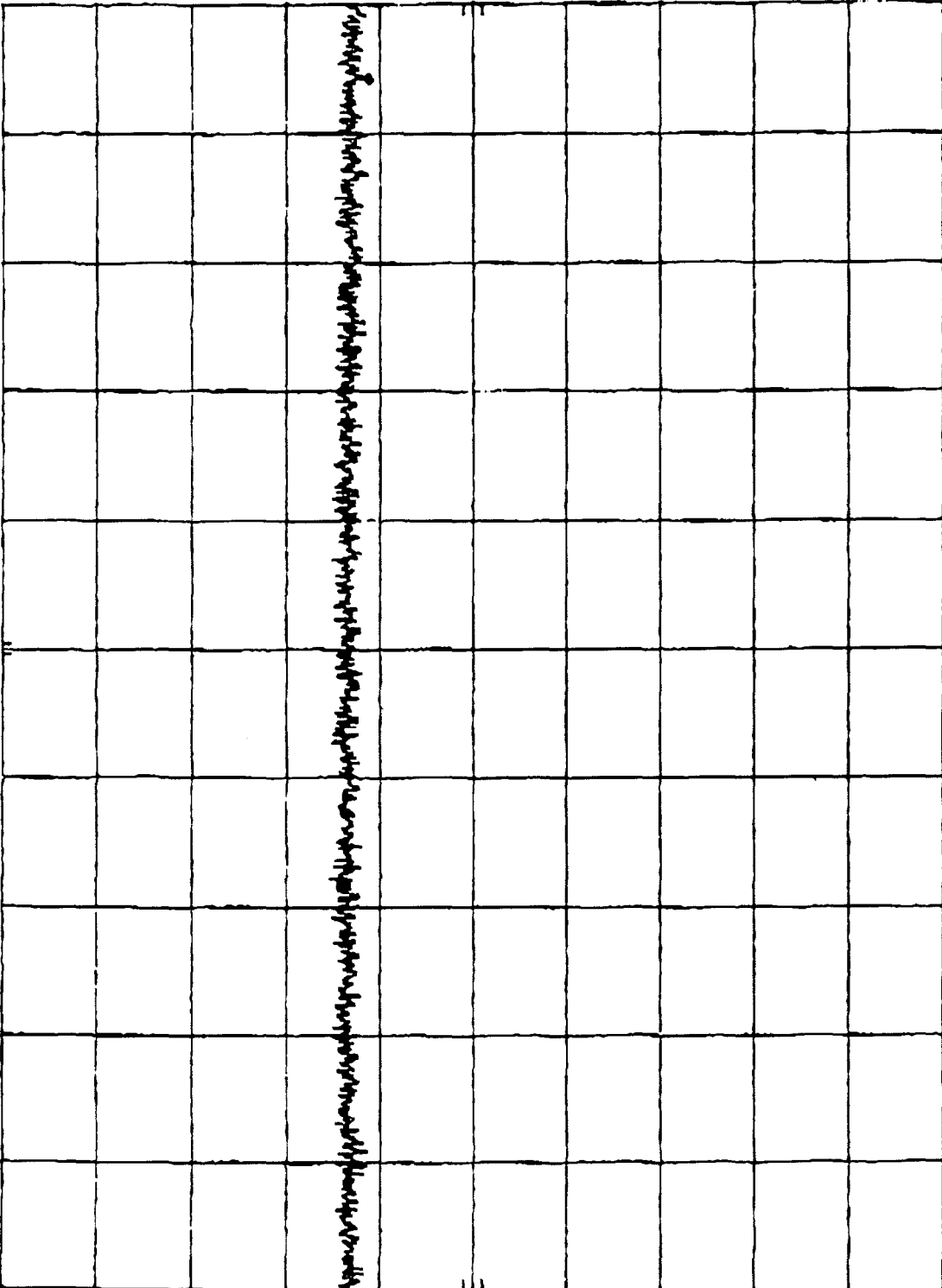
0007







REF 20.6 dBm ATTEN 30 dB Plot 4.d.7 MKR 6.068 GHz
-40.60 dBm
10 dB/
OFFSET
0.6
dB



START 5.83 GHz STOP 10.00 GHz
RES BW 1 MHz VBW 1 MHz SWP 104 msec

HP

REF 20.6 dBm

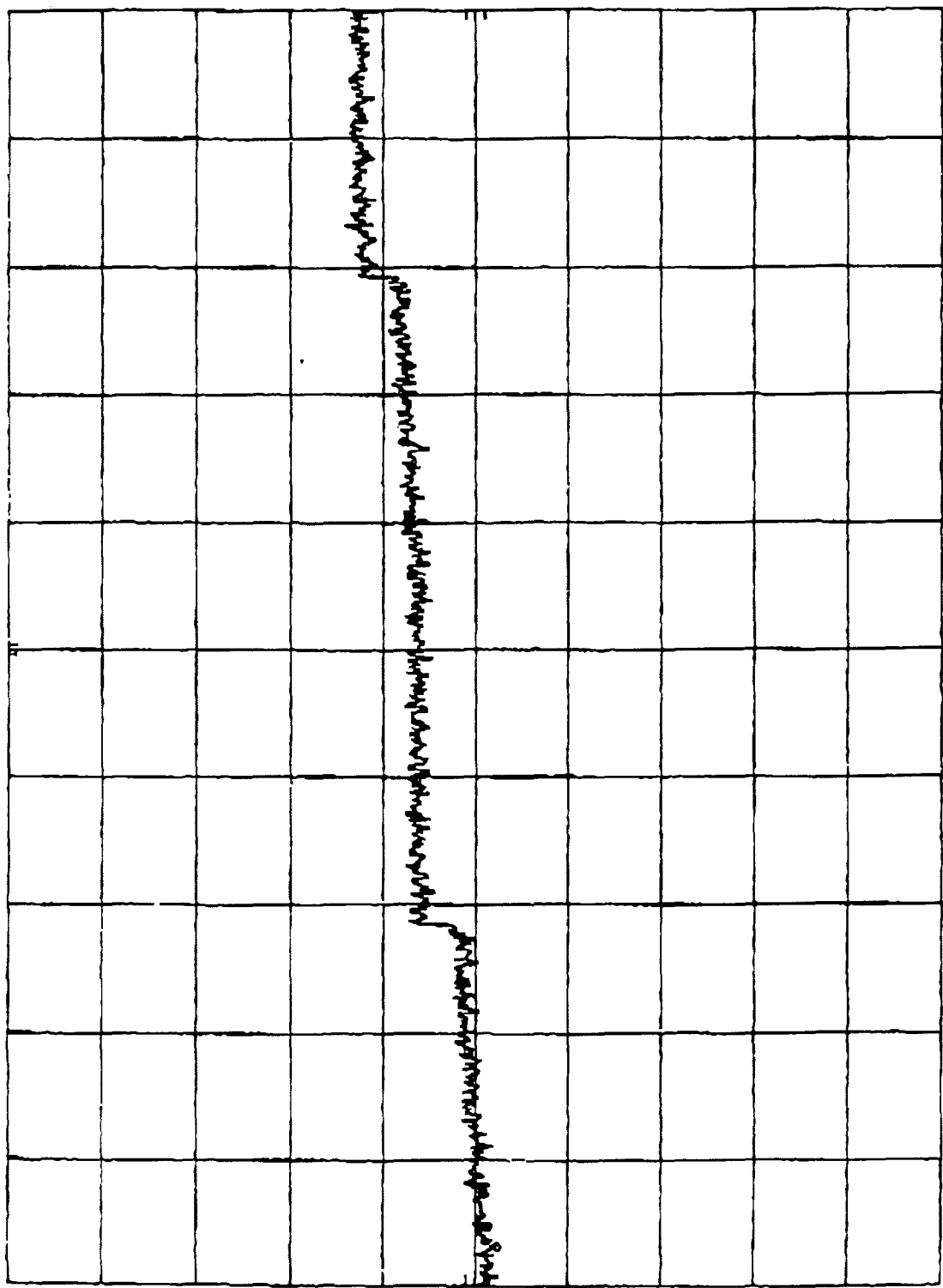
ATTEN 30 dB

MKR 21.62 GHz
-27.00 dBm

Plot 2.2.8

10 dB/

OFFSET
0.6
dB

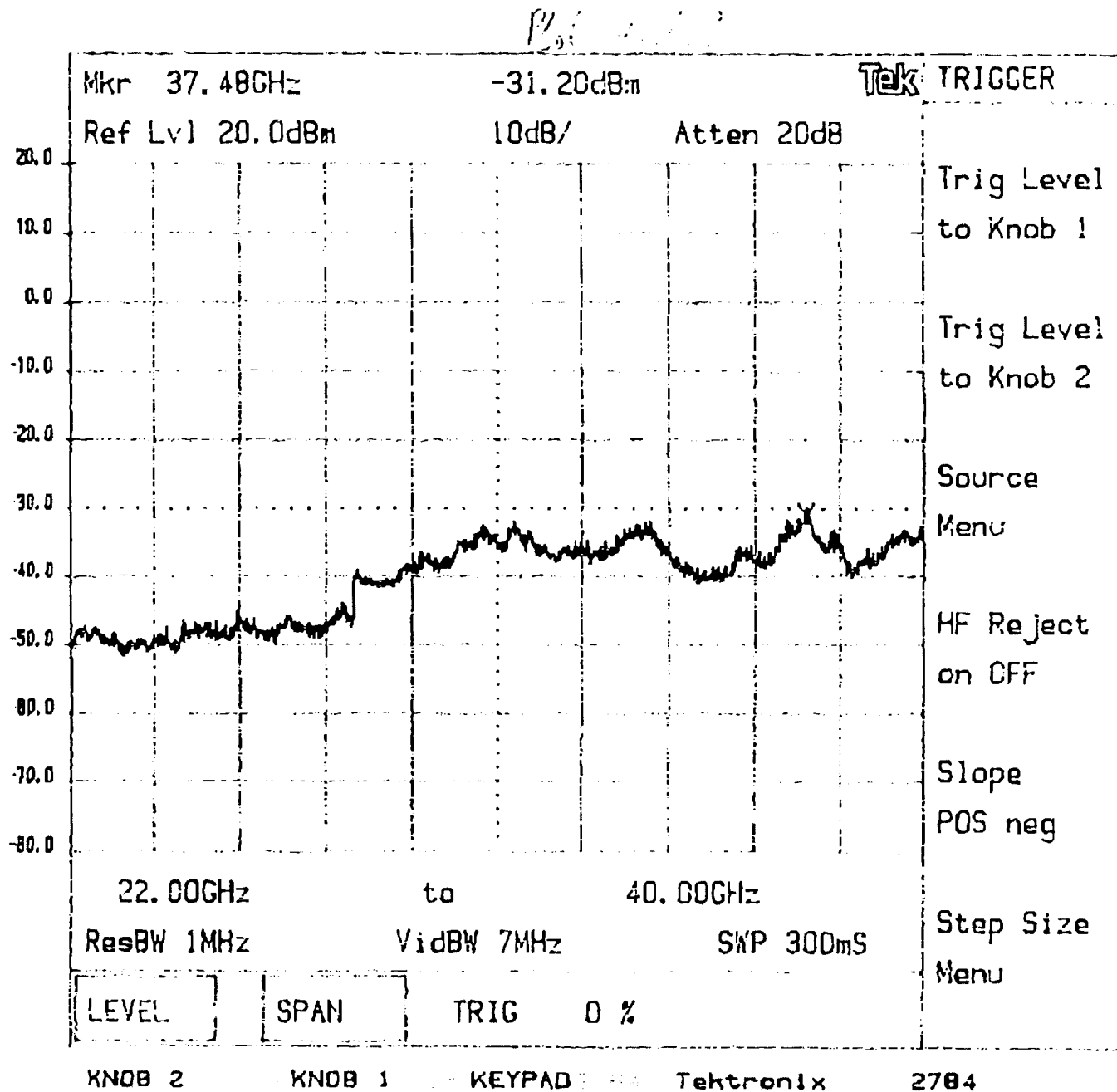


START 10.0 GHz

RES BW 1 MHz

VBW 1 MHz

STOP 22.0 GHz
SWP 300 msec



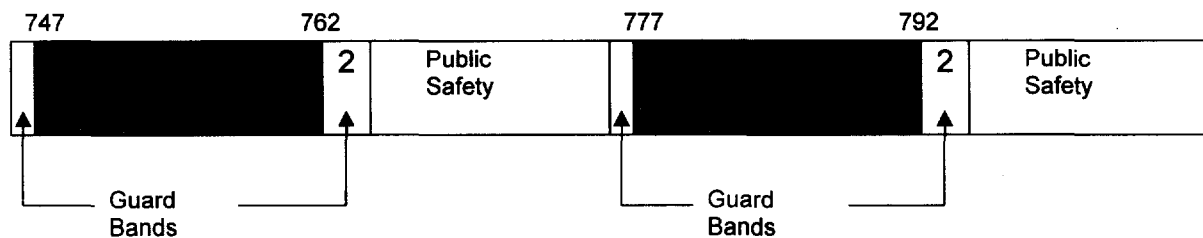
Subject: Filter Requirements and Viability for Proposed 700 MHz UHF Band Out-of-Band Emission Rules

Jim Nadeau

6 April 2000

Proposed Rules

The proposed band plan is shown in Figure 1.



TRW's proposed out-of-band emission (OOBE) rules, as submitted in *Reply Of TRW Inc. To Oppositions And/Or Comments*, are summarized here:

General requirement for base stations:

- $76 + 10\log P$ dBc from the transmitted power as measured in a 6.25 KHz bandwidth at all frequencies except those called out in the exceptions below (equivalent to -46 dBm/6.25 KHz)

General requirement for mobile and portable stations:

- $65 + 10\log P$ dBc from the transmitted power as measured in a 6.25 KHz bandwidth at all frequencies except those called out in the exceptions below (equivalent to -35 dBm/6.25 KHz)

Exceptions to the general requirement (all emitter types):

- $43 + 10\log P$ dBc from the transmitted power as measured in a 30 KHz bandwidth in the first 100 kHz adjacent to and on either side of the licensed band (equivalent to -13 dBm/ 30 KHz)
- $43 + 10\log P$ dBc from the transmitted power as measured in a 100 KHz bandwidth at offsets of 100 KHz to 500 kHz adjacent to and on either side of the licensed band (equivalent to -13 dBm/ 100 KHz)
- $43 + 10\log P$ dBc from the transmitted power as measured in a 100 KHz bandwidth in the 1 and 2 MHz guard bands¹ (equivalent to -13 dBm/ 100 KHz)

Resulting Filtering Requirements

Transmit filter requirements depend not only on the OOB emission requirements, but on the particular waveform design and modulation rate (and bandwidth efficiency achieved) within the allocated bandwidth. Also, in that the OOB constraints equate to an absolute power (independent of transmit power), the implied filtering requirement is directly proportional to transmit power.

Portable and Mobile Terminal

Derived transmit filter requirements for portable terminals are given as Figure 2, assuming operation in the 10 MHz band between 752 and 762 MHz with 30W ERP. (Required filter rejections are represented as negative numbers.) Digital modulation with symbol rate of BW/1.25 is assumed, consistent with good commercial practices.

These requirements are easily met with low cost filter implementations. Figure 3 shows an example filter performance against this requirement, assuming a 12-bit, 64-tap raised cosine digital filter with rolloff factor (α) of 0.2. Note that this assessment does not account for possible spectral regrowth due to transmit path non-linearities, but also does not assume any additional filtering other than the raised cosine pulse shaping filter. Since the requirement is shown assuming 30W ERP, the filter implementation gets still easier with 3W ERP consistent with a portable terminal.

¹ 746 to 747 MHz, 762 to 764 MHz, 776 to 777 MHz and 792 to 794 MHz

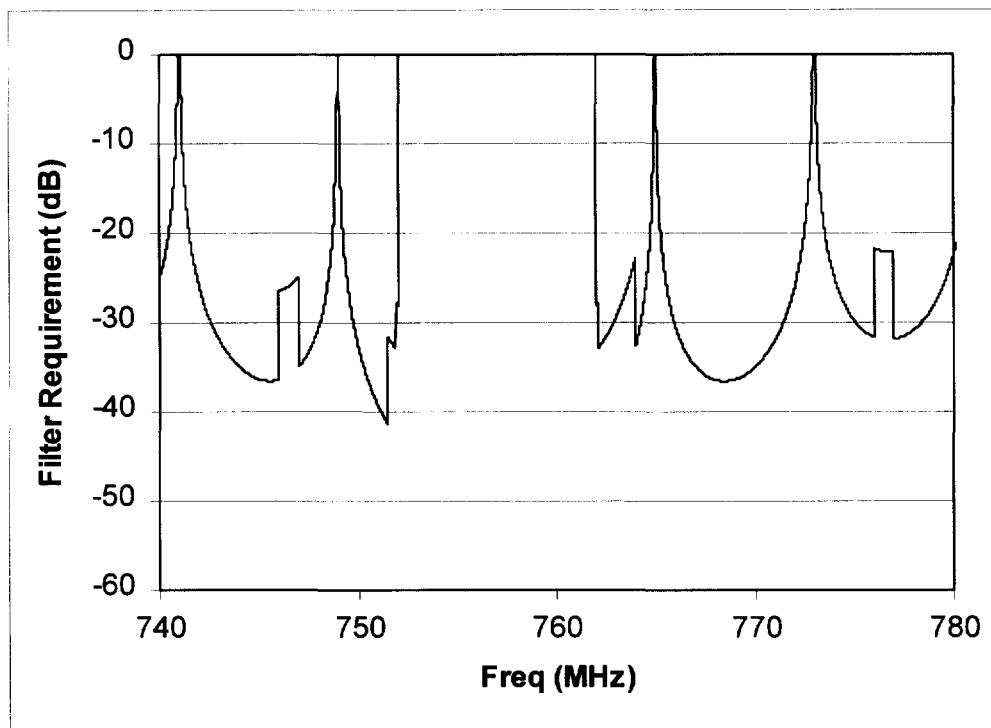


Figure 2 Transmit Filter Requirements for Portable Terminal (30W ERP assumed)

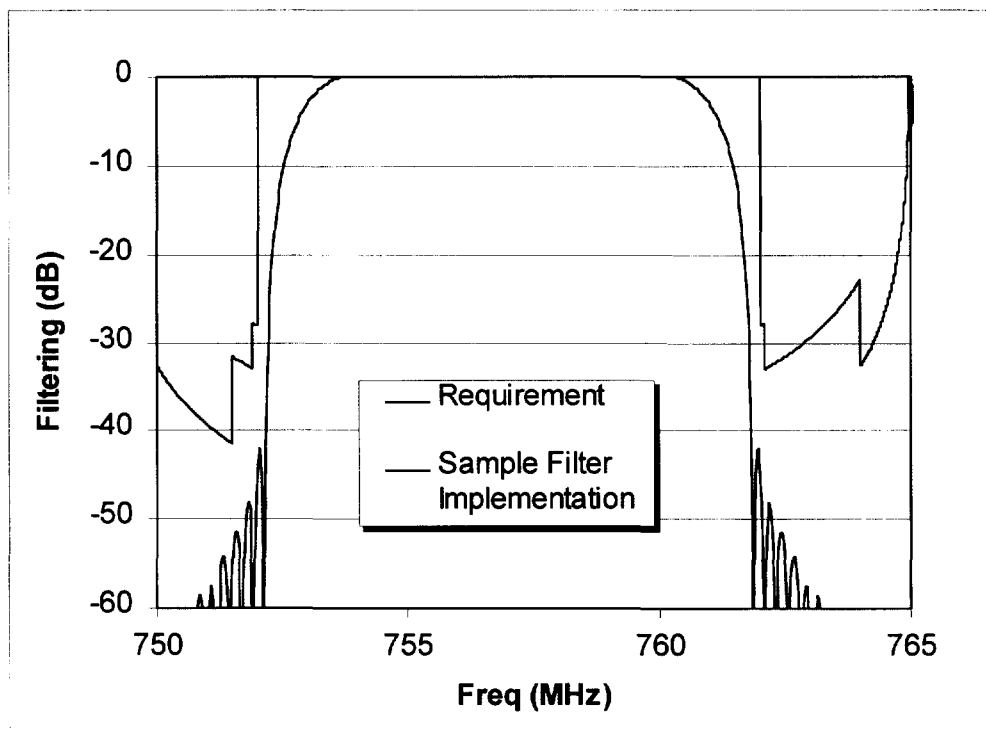


Figure 3 Close-up of Required vs. Achievable Filter Performance

Base Station

Transmit filter requirements for the higher ERPs and more stringent OOBE of the base station are considerably more challenging, but achievable with reasonable implementation complexity and good commercial practices. Derived filter requirements are given in Figure 4, assuming a (worst case) 1000 W ERP transmitter.

Figure 5 shows an example filter performance against this requirement. The implementation assumes the combination of a raised digital cosine filter, assuming a 16-bit, 128-tap raised cosine digital filter with rolloff factor (α) of 0.2, along with a 10 pole Tchebychev filter for additional rejection.

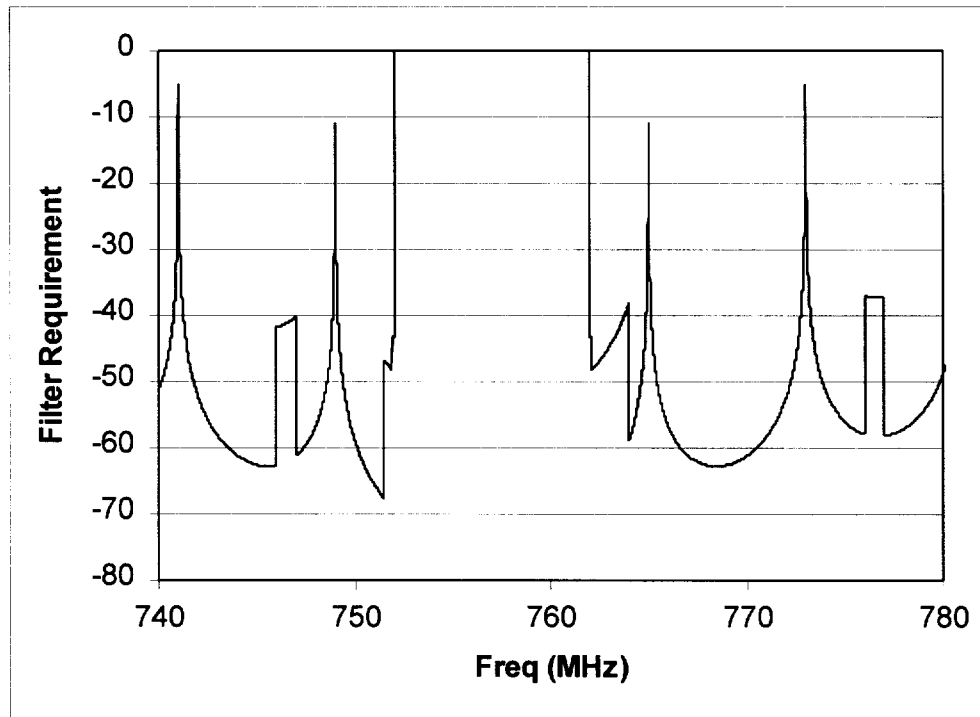


Figure 4 Transmit Filter Requirements for Base Station (1000W ERP assumed)

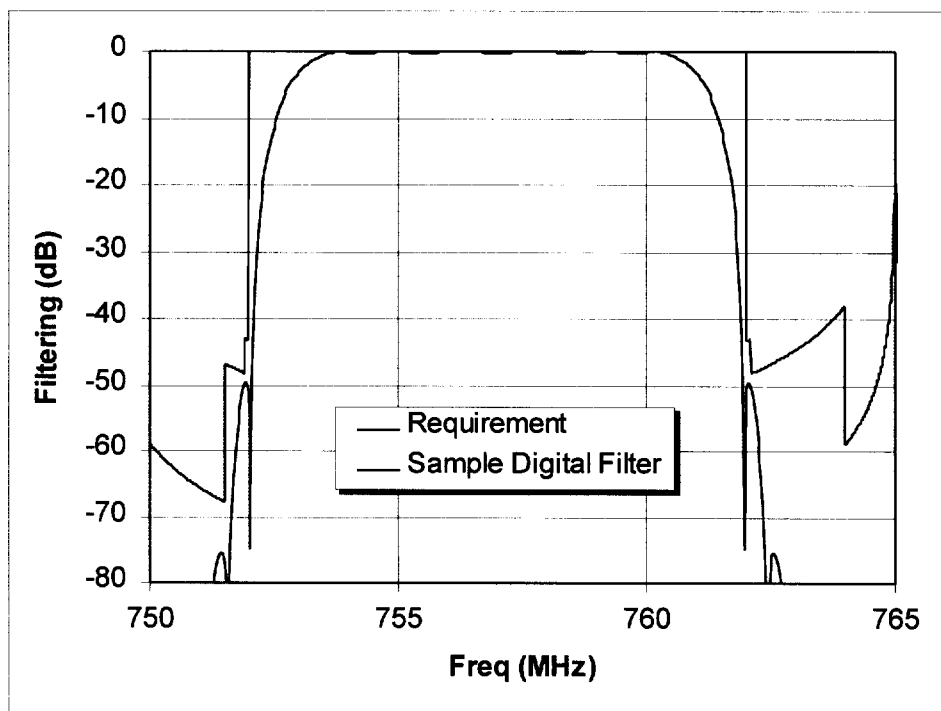


Figure 5 Required vs. Achievable Base Station Filter Performance (1000 W ERP)